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Case Report

Central Venous Catheterization via the Mid-Thigh Femoral Vein in a Morbidly Obese Patient

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SUMMARY

Thick soft-tissue and redundant skin folds seen in obese patients may lead to difficulties during central venous catheter (CVC) insertion. Here, we describe the case of a morbidly obese patient (298 kilograms) in respiratory failure and shock in whom we performed central venous catheterization via the mid-thigh femoral vein to administer fluids and drugs, while also executing a tracheostomy. We found that CVC insertion via the mid-thigh femoral vein is a fast and feasible alternate procedure in cases where catheterization of the internal jugular vein or the subclavian vein are challenging or contraindicated. Importantly, we show that dressings were clean and easy to maintain.

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1. Introduction

Obesity rates are increasing worldwide. For the elderly with increased body mass index in the intensive care unit, vascular access is essential but challenging. Central venous catheters (CVC) are inserted via the internal jugular vein (IJV), subclavian vein (SV), or inguinal femoral vein (IFV) with the Seldinger technique. Although the access mentioned above were ideal sites for CVC insertion, it may not always be feasible due to the excessive soft tissues. Thus, we propose the use of mid-thigh femoral vein as an alternative insertion site. Linfang Zhao et al. (2019) have described a series of patients with femoral inserted central catheters via mid-thigh femoral vein, where most of the indwelling catheters were single lumen (5-French) and used for chemotherapy.¹ Here, we describe our experience of successfully securing an emergent mid-thigh femoral vein access using a 7-French triple-lumen CVC in a morbidly obese patient, who also required tracheostomy as she was in septic shock and acute respiratory failure.

2. Case report

A 68-year-old morbidly obese female patient was admitted due to left leg cellulitis and acute decompensated heart failure complicated by respiratory failure. Her height was 1.56 m, weight was 298 kg, body mass index (BMI) was 122 kg/m², and co-morbidities included diabetes mellitus, chronic kidney disease stage 5, and hypertension. Intubation was difficult and led to hypoxia and cardiac arrest. An emergent tracheostomy was performed during cardiopulmonary resuscitation, and a CVC for fluid and vasoactive agent ad-

ministration was urgently required. Insertion of the CVC via the IJV or the SV was deemed to impair the surgical field during resuscitation and tracheostomy, and besides, the IJV was buried too deeply within the skin folds, which precluded maintenance of sterile conditions. Similarly, the SV was buried deep under thick adipose tissue, which posed a problem of insufficient needle length (Figure 1). Thus, insertion via IFV was considered, but was disregarded as it was also buried deep within the skin folds and the eczema in her groin posed significant infection risk.

Therefore, the mid-thigh femoral vein was chosen for venous access. The mid-thigh femoral vein identification was ultrasound-guided with the patient in the supine position and her right leg abducted and externally rotated. The right mid-thigh femoral vein was



Figure 1. Internal jugular vein and subclavian vein were difficult to approach.

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located 4 cm beneath the skin, had a diameter of 1 cm, and was present alongside the femoral artery (Figure 2). The femoral artery and vein were distinguished by Doppler. The insertion site was disinfected with 2% chlorhexidine gluconate, and under real-time ultrasound guidance, needles were inserted at an angle of 45 degrees to the surface and out of plane to facilitate successful mid-thigh femoral vein approach and guidewire placement using the modified Seldinger technique, i.e., where the insertion length was greater than 30 cm. The CVC (ARROW® 7 French 20 cm triple-lumen) had a diameter of 2.4 mm and was threaded at 30 cm. Both backflow and flushing were smooth, and the CVC was covered with 3M™ Tegaderm™.

Total procedure time was less than 5 minutes and did not require changing the patient’s position or adding further restrictions. Her shock status improved after fluid resuscitation and vasoactive agent administration via the CVC in the mid-thigh femoral vein (Figure 3). The mid-thigh femoral vein CVC remained in for 10 days where it stayed patent, blood was drawn, and medication was infused freely. At the same time, there were no reports of complications such as infection, thrombosis, catheter dysfunction nor peripheral ischemia within the 10-day period.

3. Discussion

Our case report highlights potential problems associated with traditional methods of CVC insertion via the IJV or the SV in morbidly obese patients with multiple skin folds. Moreover, during cardiac message or emergent tracheostomy, CVC insertion via a femoral vein is more feasible than via either the IJV or the SV.

Although a CVC can be inserted in the IFV simultaneously during tracheostomy, we must be careful about subsequent complications as published reports show that CVC insertion in the IFV in patients with a higher BMI can lead to higher rates of infection and haematoma development.² Additionally, IFV insertions are associated with greater chances of dressing complications, which in turn increase the probability of catheter-related bloodstream infections.³ Furthermore, emergent placements have been reported to be associated with severe retroperitoneal haemorrhage.⁴ Previously, the IFV was used for CVC insertions because the vein could be identified by palpation; however, as ultrasound-guided identification is widely used, mid-thigh femoral vein insertion has become feasible.

Given the above considerations, we gained central venous access through the mid-thigh femoral vein instead of the IFV. One pre-

vious report has mentioned that placing peripherally-inserted central catheters (PICC) in the mid-thigh femoral vein can reduce both infection rate and pain index compared to IFV;⁵ Yonghui Wan et al. (2018) described PICCs accessed via mid-thigh femoral vein, which was not only feasible but also safe for patients with superior vena cava syndrome.⁶ However, to the best of our knowledge, there are few publications that describe quick and successful insertion of a large-bore catheter in the mid-thigh femoral vein for fluid and vasoactive agent administration, and if such CVC insertion is feasible and accurate. We show that CVC insertion via the mid-thigh femoral vein is a fast method that can be executed even while performing a tracheostomy, and that it is possible that this method can reduce subsequent complications compared to access gained via the IFV. Neither catheter-related infection nor thrombosis-related events were reported in the case series with mid-thigh or lower third of thigh femoral vein catheter insertion.⁷ However, some experts suggest that the lower thigh femoral vein should be used with caution, which requires greater depth and runs the risk of catheters not reaching the IVC.⁸

Despite these advantages, relative contraindications have been proposed for mid-thigh femoral vein catheter use, such as signs of local infection, deep vein thrombosis causing upstream vein obstruction, IVC filter implantation, renal transplantation, and radiation in the thigh region.⁸ However, none of these were relevant to our patient, but adequate attention must be paid to the relative position of the femoral nerve and the femoral vein when securing access via the mid-thigh femoral vein to avoid nerve damage.⁹

The advantages of mid-thigh femoral vein insertion are as follows:

- During severe shock and respiratory failure, as seen in our patient,

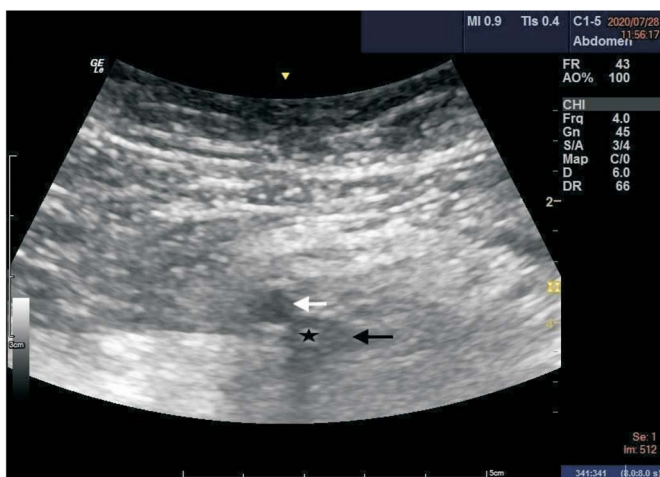


Figure 2. (White arrow) mid-thigh femoral artery; (black arrow) mid-thigh femoral vein; (black star) central venous catheter in mid-thigh femoral vein.



Figure 3. Eczema in her groin and mid-thigh femoral vein central venous catheter insertion on right thigh.

simultaneous CVC insertion and tracheostomy can be performed which can reduce the duration of shock in the patient.

- This area of the skin is smooth and without skinfolds which can reduce dressing disruptions and subsequent infections.
- It is relatively easy to clean and maintain dressing patency, i.e., avoid stool contamination.
- Away from patient's oral and nasal secretion during insertion.
- Patient movement is not limited when compared to IJV or SV, and risk of pneumothorax and/or hemothorax can be avoided.

A large-bore catheter is often needed for quick fluid resuscitation in critical care and surgery. Considering the diameter of mid-thigh femoral vein, femoral vein distance from the saphenofemoral junction (orifice of the great saphenous vein) 11–15 cm average diameter is 7.6 ± 1.7 mm, from saphenofemoral junction 16–20 cm average diameter is 7.7 ± 1.6 mm.¹⁰ A catheter-to-vein diameter ratio of less than 45% has been suggested to reduce the risk of thrombosis.¹¹ For example, the diameter of the ARROW® 7 French 20 cm triple-lumen CVC is 2.4 mm, and this is much smaller than 45% of the average diameter of the mid-thigh femoral vein. Further, Spencer et al. have suggested that if 7-French CVC is to be used, vein diameter must be greater than 4 mm, while for an 8-French CVC, vein diameter must be greater than 4.5 mm.¹²

4. Conclusion

Although mid-thigh femoral venous catheterization is not widely recognized or used, it may be a useful alternative in patients with anatomic contraindications to the use of IJV or SC catheterization. Similarly, it would be useful in instances such as when a CVC is urgently needed for quick fluid resuscitation, when the location of IJV or the SV is unsuitable, if there are difficulties in obtaining a sterile insertion site, or in patients with poor vasculature and/or severe illnesses, such as in our patient with morbid obesity. Dressing for mid-thigh femoral vein catheterization is easy to maintain and observe, and the presence of less hair and moisture in the mid-thigh region may lead to less risk of catheter-related bloodstream infections. Further studies comparing the rate of complications among IJV, SV, IFV,

and mid-thigh femoral vein catheterizations are required.

Conflict of interest

We have no known conflict of interest to disclose.

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